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II. Pectic Substances And Related Characteristics In Aqueous Extracts Of Orange Pulp[1]

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Pectic substances in orange concentrate, such as water-soluble pectin and pectinesterase, are important because they determine to a great extent the degree of gelation, which may occur in this product, as well as the amount and stability of the cloud in the reconstituted juice. Therefore, it was essential that data be obtained concerning these pectic and other related substances which are removed from orange pulp by water extraction.

The characteristics in orange juices and aqueous extracts of orange pulp which were determined and are discussed in this paper were pulp content, water-insoluble solids, pectinesterase activity, cloud, total pectin, and the water-, ammonium oxalate-, and sodium hydroxide-soluble pectic fractions. Flavonoids, as hesperidin, were also determined although such compounds are not related to the pectic substances.

Information on the processes and equipment used by the various commercial plants for the water extraction of orange pulp, as well as that on the collection of samples is presented in the first paper of this series.

Experimental Procedure

Preparation of Samples for Analysis. — Two No. 1 tin cans of each water extract and of each commercially extracted juice were removed from the -8°F. storage room and submerged in running tap water, about 80°F., for 40 minutes. Two cans of each thawed samples were combined and stirred 3 minutes after which necessary amounts were removed for determining pulp content, cloud, flavonoids, and the 3 pectic fractions. The remainder of each sample was comminuted 2 minutes in an Osterizer and quantities weighed out for determining pectinesterase activity and water-insoluble solids.

Methods of Analysis. — Pulp content was estimated by centrifuging a 50 ml sample at 1300 rpm for 10 minutes in an International Centrifuge, Size 1, Type SB and the percentage pulp by volume noted. Subsequently, centrifuged juice will be referred to as serum.

Cloud or turbidity (1, 5) in the serum was measured, as percentage light transmittance, using a Photovolt Lumetron colorimeter, Model No. 402-E, with 10 mm rectangular 14 ml cuvette and filter No. 730. An increase in percentage light transmittance actually results from a decrease in cloud, and therefore, is an indication of clarification. Degree of clarification in orange juice is indicated as follows: 0-50% = none; 60-69% = slight; 70-84% = definite; 85-100% = extreme.

Favonoids were determined, as hesperidin by an adaptation of the Davis method (2, 4) using filter No. 425 in a colorimeter and reported as milligrams per 100 milliliters of juice. Hesperidin is the principal flavonoid in orange juice.

Water-insoluble solids were determined by a modified A.O.A.C. method (8) and expressed as milligrams per 100 grams of juice or extract.

Pectinesterase activity (6, 7) is expressed by the symbol (PE.u.)g which represents the milliequivalents of ester hydrolyzed per minute per gram of soluble solids (° Brix) and multiplied by 1000 for easy interpretation. A Beckman Model K Automatic Titrator was used for maintaining the pH at 7.5 during the reaction period.

Pectin was divided into water-, ammonium oxalate- and sodium hydroxide-

Table 1. Minimum and maximum values for pectic substances and related characteristics in commercial samples of water extracts of orange pulp produced from midseason and late season fruit.

Characteristics	Water extracts of orange pulp			
	Midseason		Late season	
	Min.	Max.	Min.	Max.
Brix value	4.0°	8.6°	6.1°	8.0°
Pulp by volume — %	3.5	22.5	3.0	32.0
Water-insoluble solids — mg/100 g	0.4	270.4	0.4	364.0
Pectinesterase activity[1]	4.9	73.6	3.5	93.8
Flavonoids as hesperidin[2] — mg/100 ml	75.0	139.1	94.3	163.5
Cloud as light transmittance — %	35.0	73.0	32.0	91.0
Pectic fractions soluble in				
Water — mg/100 g	41.3	146.7	40.0	154.0
Ammonium oxalate — mg/100 g	0.0	27.3	1.5	59.0
Sodium hydroxide — mg/100 g	0.0	53.3	0.0	78.0
Total pectin — mg/100 g	47.3	210.0	51.0	282.0

1 Pectinesterase activity measured as (PE.u.)g soluble solids X 1000.
2 Determined by an adaptation of the Davis method (2, 4).

Table 2. Some characteristics of water extracts of orange pulp obtained from nine commercial plants during the processing of the 1958-59 midseason and late season packs of frozen orange concentrate.

Plant number	Pulp extraction process		Pulp by volume %		Water-insoluble solids mg/100 g		Flavonoids as hesperidin[1] mg/100 ml	
	Mid	Late	Mid	Late	Mid	Late	Mid	Late
			Values calculated to 12° Brix basis for comparison purposes					
1	CF	- -	18.5	- -	174.0	- -	236.6	- -
2	CF	CFC*	37.0	15.0	225.2	58.2	165.2	239.8
3	CFC*	CFC*	8.5	6.0	42.1	76.6	189.3	182.5
4	CFRC*	CFRC*	Footnote[2]	11.0	0.6	0.7	220.6	224.7
5	CFRC*	CFR	Footnote[2]	Footnote[2]	334.7	546.0	198.7	245.3
6	CS	CS	Footnote[2]	52.5	377.3	318.9	172.6	235.7
7	SFR	SFR	24.5	12.0	311.5	129.6	230.2	199.2
8	WDF	WDF	27.0	30.0	319.0	520.9	192.9	217.7
9	NOC*	NO	14.5	10.5	114.1	185.6	193.4	164.3
		Minimum	8.5	6.0	0.6	0.7	165.2	164.3
		Maximum	37.0	52.5	377.3	546.0	236.6	245.3

1 Determined by an adaptation of the Davis method (2, 4).
2 No separation of pulp since liquid was uniform throughout after centrifugation.

1 Cooperative research by the Florida Citrus Experiment Station and Florida Citrus Commission.

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soluble fractions and each of these pectic fractions was determined as anhydrogalacturonic acid (AGA) by an adaptation of the Dische colorimetric method (3, 7). Values are expressed as milligrams of AGA per 100 grams of juice or extract and these fractions are also expressed as percentage of total pectin.

Results and Discussion

Ranges of Values for Pectic Substances and Related Characteristics in Water Extracts of Orange Pulp. — The minimum and maximum values for pectinesterase, water-soluble pectin and other pectic substances, as well as those for some related characteristics, such as cloud and pulp content, which were found in water extracts of orange pulp are given in Table 1.

It is evident that values for all of these characteristics varied over very large ranges in both the midseason and late season samples. Only small differences are apparent between most of the minimum values for the extracts from midseason and late season fruit. However, all of the maximum values for the pectic and other substances were greater in the late season samples than those in the midseason extracts.

Effect of Different Extraction Processes on the Pectic Subsances and Related Characteristics in Water Extracts of Orange Pulp. — Data for the 8 characteristics of water extracts, calculated to a 12° Brix basis and presented in Tables 2 and 3, indicate a very wide range of values for the samples from 9 plants.

These large differences were caused primarily by the use of different procedures in the various plants for extraction of orange pulp with water. Some of the more noticeable differences in characteristics of the extracts were the result of the use of centrifuges in some plants. However, other factors were also responsible for some of these differences.

Of the 14 lowest values for all, except flavonoids, of the characteristics listed in Tables 2 and 3, 12 were in extracts obtained from plants 3, 4, and 9 and apparently the use of centrifuges in these plants was the principal factor in obtaining these low values for the pectic and related substances. The samples which had 12 of the highest values for these characteristics were from plants 5, 6, and 8 whose pulp extraction processes included recycling, use of a rotating screen, and a double finishing operation, respectively.

Although it is indicated in Tables 2 and 3 that a centrifuge was being

(Continued on page 6)

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III. Microbiological Characteristics In Aqueous Extracts Of Orange Pulp[1]

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The purpose of this paper is to report data which show some microbiological characteristics of orange juices and aqueous extracts of orange pulp, samples of which were obtained at the same time from commercial concentrate plants.

It is extremely important that the number of microorganisms in water extracts be held to a minimum and that such extracts be free of objectionable off-flavors, which can be caused by the growth of certain types of bacteria and yeast (1, 3, 4).

Information is presented in the first paper of this series on the collection of samples and about equipment and procedures used by citrus processors for the water extraction of orange pulp during the 1958-59 citrus season.

Experimental Procedure

Microbiological Methods. — Total plate counts were made using orange serum agar, pH 5.5, dextrose agar, pH 7.0, and potato dextrose agar, pH 3.4. After inoculation, the first 2 media were incubated at 30°C for 48 hours and the last medium at room temperature for 5 days. The samples were received frozen and were held in that state for not more than 1 day before plating.

Diacetyl values, which are indicative of bacterial growth (2), were determined by the following procedure using samples of either orange juices or water extracts of orange pulp. Twenty-five ml of distillate were collected from 300 ml of either orange juice or water extract of orange pulp. Ten ml of distillate were placed in a large test tube; to this was added 5 ml of a 5 per cent solution of alpha-naphthol in 95 per cent ethyl alcohol and 2 ml of a 40 per cent KOH solution containing 0.3 per cent creatine. The tube was stoppered and shaken 15 seconds, allowed to stand 10 minutes, and shaken again for 15 seconds. A reagent blank was run in the same manner simultaneously using distilled water in place of distillate. The intensity of the color produced was determined on a Fisher Electrophotometer equipped with a No. 525 filter. The reagent blank was used to null the colorimeter. Although the test is sensitive to both acetylmethylcarbinol and diacetyl, the results are expressed as parts per million of diacetyl.

Results and Discussion

Microbiological Characteristics of Midseason Water Extracts of Orange Pulp. — That microorganisms will grow in water extracts of orange pulp during the extraction process is evident from data in Table 1. High diacetyl values of 9.7 and 10.2 ppm, together with plate counts on orange serum agar of 480,000 and 569,000 per ml, were found in extracts from plants 4 and 9. Objectionable off-flavors were also easily detected in these 2 samples. Counts of 200,000 or more were obtained when four of the water extracts were plated on dextrose agar. The pH of all of the midseason water extracts, except one with a pH 3.6, was in the range of 3.9 to 4.1 which is conducive to microorganism growth. Reference to Table 5 in Part I of this series of papers will show that an off-flavor was in samples of extracts from plant 4 which were taken both before and after centrifugation. No off-flavor was detected in the extract from plant 9 before it was centrifuged, but there was an off-flavor in the sample after centrifugation. This indicated that a centrifuge may be a source of contamination, especially since the extract with the off-flavor also had a high plate count of 569,000 per ml and a high diacetyl value of 10.2 ppm, as previously mentioned. These results show that microbiological problems can arise during the production of water extracts of orange pulp.

They also provide sufficient reasons for emphasizing the necessity of applying good sanitary practices to any pulp extraction process and for seeing that the fruit solids in orange

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pulp are extracted as rapidly as possible.

As shown in Table 1, objectionable off-flavors were found in 3 of the aqueous extracts produced from midseason fruit. Of these samples, 2 were from plants 4 and 9 and the off-flavors resulted from the growth of microorganisms as indicated by both the high plate counts and high diacetyl values. The poor flavor of the extract from plant 1 was possibly caused by the use of Temple oranges of inferior quality which were being used for the production of bulk concentrate. The diacetyl value for this sample found are also presented in Table 1.

Diacetyl values in all of these juices ranged from 1.3 to 6.1 ppm and no off-flavors were detectable. Plate counts on orange serum agar and potato dextrose agar ranged from counts too low to be of significance to 512,000 and 105,000 per ml, respectively. Plate counts on dextrose agar ranged from 4,000 to 504,000 per ml.

Table 1. Microbiological characteristics of orange juices and water extracts of orange pulp obtained from nine commercial plants during the processing of the 1958-59 midseason and late season packs of frozen orange concentrate.

Plant number	Pulp extraction process		Diacetyl value ppm		Microorganism counts in thousands per ml: Oranges erum agar pH 5.5		Dextrose agar pH 7.0		Potato dextrose agar pH 3.4		Objectionable off-flavor	
	Mid	Late	Mid	Late	Mid	Late	Mid	Late	Mid	Late	Mid	Late
			Water extracts of orange pulp									
1	CF	- -	1.0	- -	34.0	- -	310.0	- -	9.5	- -	Yes[3]	- -
2	CF	CFC*	3.1	2.4	86.0	97.0	23.0	84.0	18.0	12.0	No	No
			1.7[1]	2.0[1]	30.0	28.0[1]	200.0[1]	21.0[1]	Note[2]	4.0[1]	No	No
4	CFRC*	CFRC*	9.7[1]	2.4[1]	480.0[1]	28.0[1]	430.0[1]	35.0[1]	3.0[1]	12.0[1]	Yes[4]	No
5	CFRC*	CFR	3.3[1]	1.9	54.0[1]	54.0	90.0[1]	28.0	7.0[1]	6.0	No	No
6	CS	CS	1.5	2.6	20.0	51.0	80.0	37.0	6.0	56.0	No	No
7	SFR	SFR	1.4	2.4	13.3	47.0	15.2	40.0	2.5	69.0	No	No
8	WDF	WDF	1.1	2.1	11.0	35.0	45.0	60.0	4.0	10.0	No	No
9	NOC*	NO	10.2	2.2	569.0	10.0	232.0	10.0	81.0	5.0	Yes[4]	No
	Minimum		1.0	1.9	11.0	10.0	15.2	10.0	Note[2]	4.0	- -	- -
	Maximum		10.2	2.6	569.0	97.0	430.0	84.0	81.0	69.0	- -	- -
			Orange juices									
1			1.7	- -	6.0	- -	11.0	- -	15.0	- -	No	- -
2			3.2	6.1	72.0	512.0	95.0	504.0	40.0	34.0	No	No
3			3.2	2.8	32.0	12.0	114.0	17.0	15.0	Note[2]	No	No
4			2.2	3.4	12.0	31.0	23.0	33.0	5.0	Note[2]	No	No
5			2.4	2.5	24.0	18.0	24.5	18.0	15.4	Note[2]	No	No
6			2.4	3.6	16.0	55.0	406.0	37.0	5.0	80.0	No	No
7			2.1	3.6	128.0	110.0	120.0	86.0	96.0	105.0	No	No
8			1.3	3.2	Note[2]	9.0	24.0	4.0	Note[2]	3.0	No	No
9			3.8	3.1	241.0	17.0	178.0	17.0	62.0	10.0	No	No
	Minimum		1.3	2.5	Note[2]	9.0	11.0	4.0	Note[2]	Note[2]	- -	- -
	Maximum		3.8	6.1	241.0	512.0	406.0	504.0	96.0	105.0	- -	- -

1 Data obtained using water extracts prior to centrifuging.

2 Plate counts too low to be of significance.

3 Objectionable off-flavor in water extract was possibly caused by use of Temple oranges of inferior quality; concentrate was being packed in bulk.

4 Objectionable off-flavor in water extract was caused by growth of microorganisms as indicated by the high diacetyl value and high microorganism counts.

was only 1.0 ppm and, although the plate count on dextrose agar was 310,000 per ml, the count on orange serum agar was only 34,000 per ml.

Microbiological Characteristics of Late Season Water Extracts of Orange Pulp. — Data obtained from the examination of the water extracts produced when late season fruit was being processed are given in Table I. Plate counts of less than 100,000 per ml were found on each of the 3 media used and diacetyl values were in the range of 1.9 to 2.6 ppm. Objectionable off-flavors were not evident in any of these samples. Thus, there was no evidence of growth of microorganisms in these aqueous extracts.

Microbiological Characteristics of Orange Juices. — The orange juices from both midseason and late season fruit, which were obtained from the commercial plants at the same time the samples of water extracts were collected, were examined. Results

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II. PECTIC SUBSTANCES AND RELATED CHARACTERISTICS IN AQUEOUS EXTRACTS OF ORANGE PULP:

(Continued from page 4)

used in plant 5 when the midseason samples were obtained, it was impossible to take a sample of the water extract after centrifugation. However a sample of extract before centrifugation was obtained and, therefore, high values for water-insoluble solids, pectinesterase activity, total pectin and other characeristics were found in this extract.

Many of the higher values for water-soluble pectin and flavonoids were found in the midseason extracts from plants 4, 5, 6, and 7 and in the late season extract from plant 5. The extraction processes used in these plants included recycling of extract and the use of rotating screens. Recycling provides a longer time of contact between pulp and extract resulting in the removal of larger amounts of these water-soluble substances.

The large amounts of water-soluble pectin in these samples caused them to have high relative viscosities as shown by data in Table 4 of Part I in this series of papers. Cloud or turbidity was also better in these water extracts as indicated by light transmittance values ranging from 32 to 40 per cent in comparison to a range of 51 to 73 per cent for most of the other samples.

The late season extract from plant 5 had the minimum light transmittance value of 32 per cent and the maximum values for water-soluble pectin and relative viscosity of 154.0 mg/100 g and 30.40, respectively; two of these values are shown in Table 1. The maximum value for light transmittance of 91 per cent, indicating clarification or loss of cloud, was found in the late season aqueous extract from plant 6. This sample had the minimum relative viscosity of 1.68 and also the maximum value, on a 12° Brix basis, of 97.0 mg/100 g of oxalate-soluble pectin, showing that demethoxylation of water-soluble pectin by pectinesterase had occurred.

Extraction processes used in plants 5, 6, 7, and 8 resulted in midseason water extracts of orange pulp which contained high amounts of both sodium hydroxide-soluble pectin and water-insoluble solids.

Effect of Centrifugation on the Pectic Substances and Related Characteristics in Water Extracts of Orange Pulp. — Samples of water extracts of orange pulp, before and after centrifugation, were obtained from four plants. However, from only two of these plants using a centrifuge were both midseason and late season samples of extracts collected. Data obtained from the examination of these samples are reported in Table 4.

A countercurrent flow of water and pulp through the finishers prior to centrifugation of the extract was used in plants 3 and 4; recycling of

the extract was also used in plant 4. The analyses in Table 4 show that the pulp, water-insoluble solids, pectinerase activity, flavonoids, and the pectic fractions were relatively low in the extracts from plant 3 before they were centrifuged as compared to the values in the water extracts, before centrifugation, from plant 4 in which, as previously mentioned, the extracts were recycled prior to being centrifuged.

Table 3. Pectic substances in water extracts of orange pulp obtained from nine commercial plants during the processing of 1958-59 midseason and late season packs of frozen orange concentrate.

Plant number	Pulp extraction process		Pectinesterase activity[1]		Pectin as anhydrogalacturonic acid — mg/100 g: Water soluble		Ammonium oxalate soluble		Sodium hydroxide soluble		Total	
	Mid	Late	Mid	Late	Mid	Late	Mid	Late	Mid	Late	Mid	Late
			Values calculated to 12° Brix basis for comparison purposes									
1	CF	- -	27.3	- -	144.0	- -	38.0	- -	48.0	- -	230.0	- -
2	CF	CFC*	17.6	14.5	106.7	145.6	43.7	9.8	50.1	12.8	200.5	168.2
3	CFC*	CFC*	7.3	9.1	101.0	77.4	4.9	9.7	9.8	11.6	115.7	98.7
4	CFRC*	CFRC*	4.9	3.5	228.6	153.4	0.0	2.5	0.0	0.0	228.6	155.9
5	CFRC*	CFR	49.5	61.7	234.0	231.0	34.1	75.0	67.2	117.0	335.3	423.0
6	CS	CS	73.6	43.4	176.4	103.6	38.0	97.0	74.3	60.8	288.7	261.4
7	SFR	SFR	26.6	19.1	184.6	102.8	38.2	25.7	64.0	32.6	286.8	161.1
8	WDF	WDF	33.2	93.8	86.0	129.6	41.5	90.9	75.9	129.7	203.4	350.2
9	NOC*	NO	17.8	27.5	114.1	64.9	25.9	24.3	36.2	40.6	176.2	129.8
		Minimum	4.9	3.5	86.0	64.9	0.0	2.5	0.0	0.0	115.7	98.7
		Maximum	73.6	93.8	234.0	231.0	43.7	97.0	75.9	129.7	335.3	423.0

[1] Pectinesterase activity measured as (PE.u.)g solubie solids X 1000.

The reduction in water-insoluble solids after centrifugation of the midseason samples from plants 3, 4, and 9 was 66, 99, and 44 per cent, respectively; also, from plants 2, 3, and 4, the reduction in this characteristic was 84, 64, and 99 per cent, respectively, for the late season water extracts. Pectinesterase activity, which is associated with the solid particles, was reduced also as the insoluble solids were lowered.

In the midseason extracts from plants 3, 4, and 9 there was a reduction in this enzymic activity of 47, 93, and 18 per cent, respectively, and of 73, 63, and 97 per cent, respectively, in the late season samples from plants 2, 3, and 4.

Centrifugation only slightly decreased the flavonoid values. Also cloud, determined as percentage light transmittance, remained about the same, except for the midseason extracts from plant 4 whose values were 69 and 37 per cent before and after centrifugation.

It would appear that the quantity of water-soluble pectin, which gives consistency or body to a product, did not change when 5 of the 6 water extracts were centrifuged, but actually after removal of the insoluble pectic fractions, the water-soluble fraction increased when based on the percentage of total pectin as shown in Table 4.

There was a very large difference in the water-soluble pectin in the extracts from plant 4 before and after centrifugation as shown by the values 86.7 and 146.7 mg/100 g. This large difference is not believed to have been caused by centrifugation but by other unknown factors.

The insoluble pectic fractions, which are solubilized by ammonium oxalate and sodium hydroxide, were also greatly reduced in the water extracts by centrifugation; in three instances there was 100 per cent removal of these substances from the extracts. An excellent criterion of pectin demethoxylation during processing is when the percentage of the ammonium oxalate-soluble fraction, based on total pectin, approaches or exceeds the percentage of water-soluble pectin.

Data in Table 4 show that in the midseason extract from plant 4, before it was centrifuged, the values were 36.9 per cent for the water-soluble and 38.9 per cent for the ammonium oxalate-soluble pectins. This particular sample represented a water extract which had been held for some time in tanks for recycling because processing had been stopped for cleaning other processing equipment and the very high pectinesterase activity of 70 units in this extract rapidly brought about the demethoxylation of the water-soluble pectin.

Comparison of Values for Pectic Substances and Related Characteristics in Water Extracts of Orange Pulp with those in Orange Juices. — Samples of orange juices were taken in the commercial plants at the same time when the water extracts of orange pulp were collected. Minimum and maximum values for pectic substances and related compounds found in these juices are given in Table 5 along with values for the aqueous extracts, which are calculated to a 12° Brix basis.

Relationships between the different amounts of these substances in the aqueous extracts and orange juices

(Continued on page 9)

Table 4. Effect of centrifugation for removal of pulp on the pectic substances and related characteristics of water extracts of orange pulp during the processing of the 1958-59 midseason and late season packs of frozen orange concentrate.

Characteristics		Plant No. 2 CFC*		Plant No. 3 CFC*		Plant No. 4 CFRC*		Plant No. 9 NOC*	
		Values before and after centrifugation							
		Before	After	Before	After	Before	After	Before	After
Pulp by volume — %	Mid	- -	- -	5.5	3.5	34.5	Footnote[3]	13.0	9.0
	Late	11.5	7.5	6.0	3.0	13.0	6.5	- -	- -
Water-insoluble solids — mg/100 g	Mid	- -	- -	50.0	17.2	238.8	0.4	130.4	73.2
	Late	182.4	29.6	110.4	39.6	304.4	0.4	- -	- -
Pectinesterase activity[1]	Mid	- -	- -	13.7	7.3	70.0	4.9	21.8	17.8
	Late	52.9	14.5	24.6	9.1	102.8	3.5	- -	- -
Flavonoids as hesperidin[2] — mg/100 ml	Mid	- -	- -	81.2	75.0	160.6	139.1	136.2	121.9
	Late	124.8	121.9	94.3	94.3	150.6	134.8	- -	- -
Cloud as light transmittance — %	Mid	- -	- -	63.0	63.0	69.0	37.0	42.0	41.0
	Late	55.0	52.0	59.0	52.0	57.0	45.0	- -	- -
Pectic fractions soluble in									
Water — mg/100 g	Mid	- -	- -	41.3	41.3	86.7	146.7	72.0	73.3
	Late	78.0	74.0	40.0	40.0	85.0	92.0	- -	- -
Ammonium oxalate — mg/00 g	Mid	- -	- -	5.0	2.0	91.3	0.0	21.3	16.7
	Late	22.0	5.0	13.0	5.0	53.0	1.5	- -	- -
Sodium hydroxide — mg/00 g	Mid	- -	- -	12.0	4.0	56.7	0.0	32.0	23.3
	Late	43.0	6.5	21.0	6.0	78.0	0.0	- -	- -
Total pectin — mg/100 g	Mid	- -	- -	58.3	47.3	234.7	146.7	125.3	113.3
	Late	143.0	85.5	74.0	51.0	216.0	93.5	- -	- -
Percentage of total pectin									
Water-soluble — %	Mid	- -	- -	70.8	87.3	36.9	100.0	57.5	64.7
	Late	54.5	86.5	54.0	78.4	39.4	98.4	- -	- -
Amminium oxalate-soluble — %	Mid	- -	- -	8.6	4.2	38.9	0.0	17.0	14.7
	Late	15.4	5.9	17.6	9.8	24.5	1.6	- -	- -
Sodium hydroxide-soluble — %	Mid	- -	- -	20.6	8.5	24.2	0.0	25.5	20.6
	Late	30.1	7.6	28.4	11.8	36.1	0.0	- -	- -

[1] Pectinesterase activity measured as (PE.u.)g soluble solids X 1000.
[2] Determined by an adaptation of the Davis method (2, 4).
[3] No separation of pulp since liquid was uniform throughout after centrifugation.

III. MICROBIOLOGICAL CHARACTERISTICS IN AQUEOUS EXTRACTS OF ORANGE PULP

(Continued from page 7)

become evident on comparison of the data in Table 5.

Maximum values for all of the characteristics in the late season extracts of orange pulp were greater than those in the extracts produced from midseason fruit, with the exception of water-soluble pectin for which both the minimum and maximum values were smaller in the late season extracts. However, the maximum values for all, except one, of the late season orange juices were smaller than those in the midseason juices; the exception was water-in soluble solids for which larger minimum and maximum values were found in the late season juices.

In both the midseason and late season extracts the maximum values for all of the pectic and other substances were greater than those in the juices. Minimum values for flavonoids, water-soluble and total pectins were also larger in the extracts. However, the minimum values for pulp, water-insoluble solids, pectinesterase activity, oxalate- and sodium hydroxide-soluble pectins were found to be greater in all of the juices than those in the extracts. Of interest were the ranges of flavonoids in the water extracts which were found to be almost the same in both the midseason and late season samples.

Comparison of the values for the characteristics listed in Table 5 for each of the 9 midseason and 8 late season water extracts with those for the corresponding orange juices indicated the following relationships. The amounts of flavonoids, water-soluble pectin, and total pectin were always greater in the extracts than in the juices.

In 12 of the 17 extracts or 71 per cent, the pulp content was larger than in the corresponding juices. Water-insoluble solids, oxalate- and sodium hydroxide-soluble pectins were found in larger quantities in 65 per cent of the water extracts. Pectinesterase activity was greater in 9 of the 17 samples of extract or 53 per cent.

Thus, more flavonoids, water-soluble pectin, and total pectin were found in all of the water extracts of orange pulp than in the orange juices collected from the same plants at the same time and more of the other pectic and related substances were found in a majority of the aqueous extracts.

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Table 5. Comparison of minimum and maximum values for pectic substances and related characteristics in commercial samples of orange juices and water extracts of orange pulp produced from midseason and late season fruit.

Characteristics	Values in water extracts of orange pulp calculated to 12° Brix basis				Orange juices			
	Midseason		Late season		Midseason		Late season	
	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.
Brix value	12.0	12.0	12.0	12.0	11.2	13.6	10.7	12.4
Pulp by volume — %	8.5	37.0	6.0	52.5	11.0	23.0	9.5	13.5
Water-insoluble solids — mg/100 g	0.6	377.3	0.7	546.0	72.0	220.8	160.8	224.4
Pectinesterase activity[1]	4.9	73.6	3.5	93.8	14.3	38.6	16.9	24.0
Flavonoids as hesperidin[2] — mg/100 ml	165.2	236.6	164.3	245.3	63.1	129.1	52.9	68.8
Pectic fractions soluble in								
Water — mg/100 g	86.0	234.0	64.9	231.0	25.3	52.0	20.0	29.3
Ammonium oxalate — mg/100 g	0.0	43.7	2.5	97.0	14.0	32.7	13.0	24.7
Sodium hydroxide — mg/100 g	0.0	75.9	0.0	129.7	32.7	48.7	27.3	35.3
Total pectin — mg/100 g	115.7	335.3	98.7	423.0	80.7	116.0	61.0	88.0

[1] Pectinesterase activity measured as (PE.u.)g soluble solids X 1000.
[2] Determined by an adaptation of the Davis method (2, 4).

Hancock Promises To Enforce All Regulations

Uniform enforcement of all rules and regulations affecting Florida's agricultural industry has been pledged by W. R. (Buster) Hancock, candidate for Commissioner of Agriculture.

The candidate said he has taken the position that all enforcement of laws under his jurisdiction, if elected, will be conducted on a fair and impartial basis.

He said certain individuals in the citrus industry had indicated that they believe pressure has been brought to bear to relax inspection and enforcement in certain areas.

If elected, there will be no organization or pressure groups which can influence me on enforcement of laws regulating our citrus industry. No true friend of the citrus industry would want any relaxation of the rules. Grower, packer and processor will be treated with the same uniformity when it comes to inspections by the Department of Agriculture," he declared.

The Groveland citrus grower commented that the inspection rules are enforced for the good of the industry and the consumer.

Hancock noted that as a citrus grower and successful businessman he is the only candidate in the race that is fully familiar with citrus problems.

Meet your ORTHO team...

CLIFF SUTTON

Manager of North Florida Branch of Calspray located in Orlando. Received his B. S. degree in agriculture from University of Florida. Call Cliff at Winter Garden Branch Office, OL 6-2626.

CHARLES ASHLEY

Received his B. S. in entomology from Auburn. Worked three years citrus spraying and two years as a laboratory assistant before joining Calspray. Resides in Leesburg, phone ST 7-2063.

WEBSTER CARSON

Joined Calspray in 1956 after receiving his B. S. degree in agriculture from University of Florida. Resides in Plant City—contact him by calling 3-8351.

JEAN MABRY

Served as an entomologist for two years with the U. S. Army before joining Calspray in 1955. Received his degree in agriculture from U. of Florida. Jean resides in Lakeland. Call MU 6-4515.

J. S. MURPHY

Received his degree in agriculture from University of Florida. Before joining Calspray in 1955, worked at Citrus Experiment Station. Resides in Lake Alfred, phone FR 2-1422.

JOHN NOWELL

Received his B. S. degree in agriculture from University of Florida. Joined Calspray in 1955. John lives in Orlando. Reach him at GArden 4-6754.

RANDALL WILLIAMS

Randy sold livestock and poultry feeds before joining Calspray in 1957. Received his degree in agriculture from University of Florida. Resides in Deland. Reach him by calling RE 4-0599.

What Does Increase In Population Mean To Our Citrus Industry?

By W. C. PEDERSEN, President
Waverly Growers Cooperative

Senator Holland's WASHINGTON REPORT of February 20, 1960, mentioned that it was necessary for the Senate Appropriations Subcommittee on Commerce to ask Congress to appropriate money to purchase machines to help count the population of the U.S.A., which will run somewhere near 180 million people.

"Counting a national population of some 180 million is a gigantic undertaking and testimony revealed that four Univacs and six large-scale computers will be used to complete the job with all possible speed and accuracy. An important by-product of the census will be the development of a great mass of information useful to many of the nation's businesses. Final figures on the census should be available by November 1."

The 1960 census will provide many useful figures for the Florida citrus industry. If they do come out with a population figure of nearly 180 million mouths to feed in the U.S.A., it will mean that there would be the capacity to eat Florida citrus fruit in the direct ratio to our production and population in 1950, which was as follows:

In 1950 we had a population in the U. S. of 150,697,361, and in all areas of the U. S. we produced 161,810,000 boxes of oranges, grapefruit and tangerines. If there were no other elements to interfere with the ratio, it would mean that in 1960 we could sell and feed the 180 million people 194,372,000 boxes of citrus fruit raised in the United States.

This year our citrus production of oranges, grapefruit and tangerines in the U.S.A. is estimated to be 180,645,000 boxes. If we just consider the population figures, it would look like we will have room for about 13,727,000 more boxes of fruit for consumption in the U.S. Of course some of our fruit has been exported to Canada and a little to other places, and I presume that these foreign customers will continue to take their proportion of our production.

The world population is increasing at an unprecedented rate. The United Nations estimates that the world population is growing by 5,600 people every hour, or 49,000,000 a year, which is about the population of Great Britain. Of course, other citrus producing areas are also expanding their citrus production.

It is now estimated that the world population is approaching the 3 billion mark, and perhaps half these people do not have enough to eat. Practically all people like citrus fruit. Of course there are many that haven't been able to afford it, but better distribution, education and advance of better economy in many countries should take care of the wants of many millions of people, and dispose of the millions of boxes of citrus fruit that will be produced in the United States and other parts of the world during the next decade.

Last year there were about 425 million boxes of citrus fruit produced in the entire world, or about .14 of a box of fruit per person. In the U. S. our consumption is now, and has been for the past ten years, better than one box to a person.

If we in America increase our citrus production at the same rate as we have been for the past ten years, in 1969-70 we should produce about 212 million boxes of oranges, grapefruit and tangerines. There will be many ups and downs in our citrus industry, but it now appears that if our population continues to increase at the present rate we will have more than enough people to eat our U.S.A. citrus crop if it is properly distributed.

The United States is the world's largest exporter of farm products. In fiscal 1959, the United States supplied 17 percent of the world's export volume in commodities like those produced in this country.

Savage Outlines Points On Grove Management

BY ZACH SAVAGE
Agricultural Economist
Agricultural Experiment Stations

Most citrus growers endeavor to derive a profit from their grove business.

In the management of groves, the usual aim of growers is to maximize profits by performing such practices and management as will bring about the maximum continuous net returns. To bring this about, there are many things to be considered. Some of the points to be considered are presented here but no attempt has been made to arrange in order of importance.

All these points and others should be considered in the management of each and every grove.

1. Keep a good grove record and it will keep you.

2. Make and put into operation a plan for each grove unit for the season. Remake and operate plans in each succeeding season.

3. Estimate income and expenses — plan accordingly.

4. Pencil pushing involves considerable effort and hard work but could be biggest profit maker if done correctly.

5. The profitableness of irrigation is questionable on many groves that have deep root penetration into the soil. If irrigation is practiced, test each grove unit for its profitableness.

6. Time spent in working out a grove plan for the season may be the most rewarding of time spent at any other grove job.

7. Include a good tree chart in grove plans. Indicate trees needing special attention and trees that should be replaced. It pays to maintain a full stand of producing trees.

8. Fertilizer is one of the best profit makers per dollar spent. Adequate fertilizer is very necessary. However, too much fertilizer in total or in excessive amounts of some elements do not result in economical fruit production. See Bulletin 536A, Agricultural Experiment Stations, Gainesville.

9. Do not expect production costs per acre to decrease materially in the immediate future.

10. Labor, power and equipment costs during the past two seasons made up over half the operating or cash costs. This item affords a good opportunity for reduction in costs on many groves.

11. Capital requirements are highest in history and will get higher.

12. Capital requirements have grown so much that it is becoming increasingly difficult for an individual, during his productive years, to accumulate a sufficient amount of money to finance an economically sized grove unit.

13. The perfection of additional machines will result in the displacement of some of the man labor in groves. This will mean higher investments in equipment.

14. Technological developments have increased rapidly in citrus production and marketing. These developments are expected to continue.

15. Adjustments for taking advantage of larger unit operations might be advisable for some growers. Many have been taking advantage of larger unit operations and equiment ownership through working arrangements with nearby growers and through cooperative and other caretaking organizations.

16. Economic conditions are changing rapidly for individual growers.

17. Managers who fail to develop an economic approach to their grove problems will find it increasingly difficult to gain or maintain grove profits. This will be true regardless of size of grove unit.

18. Profits can be made in citrus fruit production by some growers, both in good times and in bad. The most efficient will be the winners in all times.

19. Managerial capacity is even more difficult to pass from father to son than accumulated capital or property.

20. Management is now the critical factor in successful grove operation. This means a highly specialized kind of management where records are extremely valuable.

21. Profitable decisions are more likely to result from well conceived planning on paper, backed by sound facts and figures, than from the too common, haphazard, off-the-cuff method.

22. Negotiated pricing may tend to displace the competitive price-making structure. This has already taken place in some fruits and vegetables grown under contract for specialized processing.

23. Managers of citrus production, processing and distribution firms are challenged to give intelligent direction to the changes ahead, so that our citrus industry will function even better than now.

24. With proper direction, changes can result in increased production and distribution efficiency, added control of quality, less risk of price and income variations to the grower, more rapid adaptation to scientific and technological innovations and increased profits to those growers who are able to improve their methods along with these changes.

25. "There is more in the man than in the land," is true in citrus production and management.

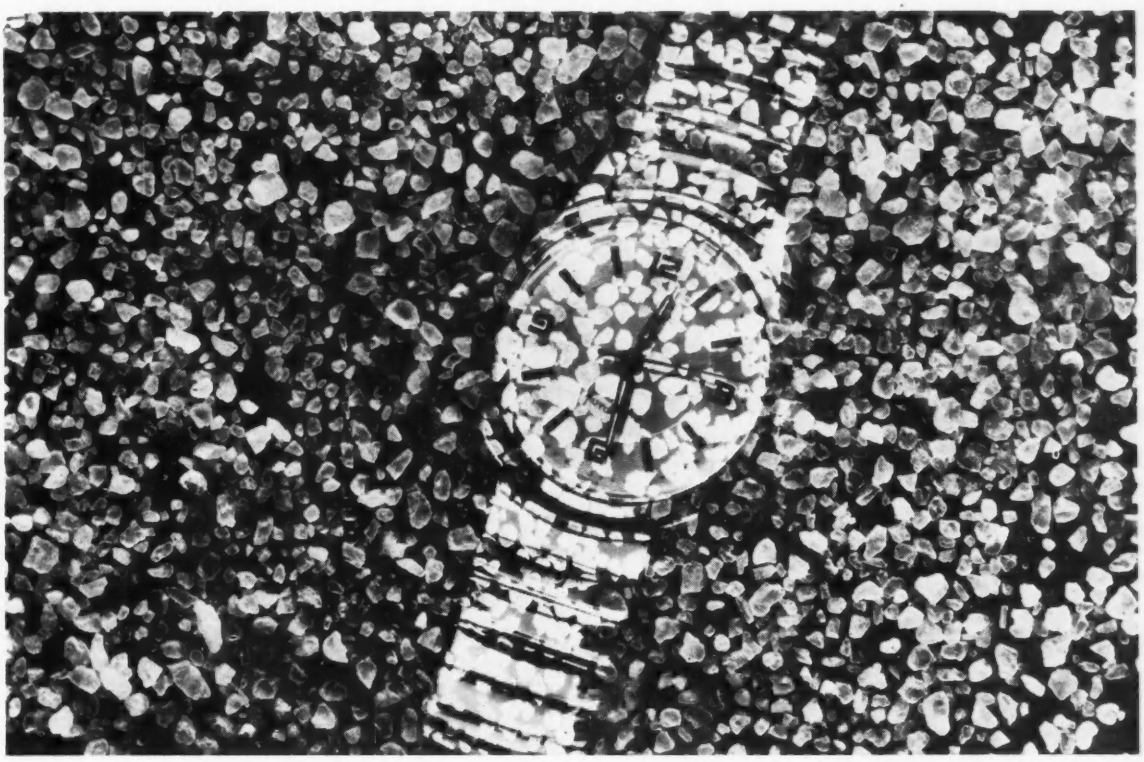
26. There is no room for mistakes in citrus production and distribution.

Fertilizer Use Gain Predicted

Fertilizer consumption for the crop year ending June 30 will equal or surpass last year's record-breaking pace, T. M. Ware, president of International Minerals and Chemical Corporation, told a nation-wide panel of leading fertilizer manufacturers recently.

Fertilizer consumption for the six months ending December were 8 per cent below the first half of the record-setting 1958-59 crop year, Ware said, because of heavy precipitation in September, October, and December which slowed or stopped farm work.

Ware's report was made at a meeting of 12 fertilizer manufacturers sitting as a representative panel to discuss trends, objectives, and problems of the fertilizer industry.



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Importance Of Quarantine Service Emphasized By USDA

"Quarantine can mean the difference between plenty and want," in the opinion of John Ward, assistant in charge of quarantine inspection at the port of Miami.

Speaking before the State Plant Board's annual training conference Ward assured the group that the U. S. Department of Agriculture was doing an effective job in preventing new agricultural pests from entering the country. If the job were not effective, then the tremendous value of Florida's agricultural crops could be slashed by invasions of dangerous insect pests.

Watch All Avenues

"Avenues of entry being watched are plants, soil, fruits and vegetables, baggage, stores and quarters of vessels, mail and restricted cargo," he declared. "We've even picked up serious nematodes from soil adhering to the tires of imported cars."

The quarantine specialist pointed out that it might be rather difficult for some pests to become established even if introduced into the state, since the pests would be affected by natural predators, climatic conditions and other factors. "In the final analysis," he said, "plant quarantine doesn't have to intercept every individual pest specimen to prevent establishment of a new plant pest."

Ward said that he agreed with the U. S. State Department's policy of encouraging free trade, but not to the extent of endangering American agriculture. "There are too many importers and brokers seeking a fast dollar," he claimed.

B. P. Stewart, in charge of the Plant Quarantine fumigation station at Miami International Airport, discussed the setup maintained there by the quarantine service. "We have a hot-water tank for treating the roots of plants for nematodes, a hot-air treater and a pressure cooker for treating soil, and two vacuum fumigation chambers to kill surface pest on plants. However," he added, "the elimination of plant diseases on imported plants is rough. The only sure cure is burning the plants."

Methods Improved

Stewart informed the Plant Board inspectors that his agency continually is improving its work. "Orchid rust is a good example of this," he said. "We didn't think our treatment good enough, so we worked out a better system with the State Plant Board wherebey suspicious plants are held under postentry inspection for further observation before release to the importer."

For persons wanting to import plants, Stewart advised: "The younger the plant, the more chance of surviving shipment and treatments. All plants imported by mail must have the federal green-and-yellow importation tag. To secure such a permit, application should be made directly to the Import Permit Section, 209 River Street, Hoboken, New Jersey."

Sites Now Expt. Sta. Associate Director

Dr. John W. Sites has been named associate director of the University of Florida Agricultural Experiment Stations, succeeding Dr. Roger W. Bledsoe, who died January 24.

His appointment has been approved by the State budget commission and State Board of Control, following recommendation by President J. Wayne Reitz, Provost Willard M. Fifield and Director J. R. Beckenbach.

Sites was assitant director of the Experiment stations from 1955 until 1957, when he became head of the fruit crops department research, teaching and extension activities. Until a successor in the department post is named, he will continue to head it.

He came to the Florida Agricultural Experiment Stations in 1942 as associate horticulturist at the Citrus Station, Lake Alfred.

A native of Syracuse, N. Y., he holds three degrees from Ohio State University.

Before joining the Florida staff, he was with the U. S. Department of Agriculture Soil Conservation Service in Ohio. In 1946 the Ohio Horticulture Society named him the outstanding horticulture student at Ohio State University.

Sites has written many scientific papers on the Florida citrus industry.

He is a member of Pi Alpha Xi honorary fraternity, Alpha Gamma Rho social fraternity, Sigma Xi scientific honorary, the American Society for Horticultural Science, the Florida State Horticultural Society and the Kiwanis Club.

At the beginning of 1960, some 200 counties in 30 states were participating in the Rural Development Program.

Spray With MH And Help Citrus Trees Avoid Cold Damage

Spraying citrus trees with maleic hydrazide (MH), a growth-inhibiting chemical, will induce complete dormancy and help avoid damage from cold weather, it has been found by Drs. Ivan Stewart and C. D. Leonard of the Citrus Experiment Station, Lake Alfred.

The material can be applied to citrus trees before cold weather strikes or immediately after the trees are defoliated by cold. Defoliated trees have a tendency to shoot new growth as soon as warm weather returns, and are thus "sitting ducks" for later freezes the same seeason.

The destructive cold of 1957-58 caused a stepup in efforts to find a material that would induce dormancy and thus prevent some of the damage caused by occasional Florida freezes.

That winter Drs. Stewart and Leonard sprayed maleic hydrazide on large grapefruit trees that had been defoliated by the cold. The sprayed trees remained dormant, while unsprayed trees produced new growth shortly after defoliation and were injured by subsequent freezes.

During the fall of 1958 the investigators applied MH sprays at 1,000 parts per million to young orange trees in an effort to increase their cold hardiness. No treated trees produced new growth during the winter. Adjacent untreated trees continued to put out new flushes throughout the winter.

MH is a plant growth regulator and its action on citrus has not been fully tested. Further studies are underway to determine the conditions under which this new spray can best be tested.

Only one person in eight now lives on the farm compared with one in six in 1950 and one in three 50 years ago. According to a report by the Bureau of the Census, Department of Commerce and the Agricultural Marketing Service, today's farm population is 21.2 million compared with 25.1 million in 1950. Since 1950 the farm population has decreased by 3.9 million, or 15.5 percent.

U. S. Food Supply Declared Wholesome

Our food supply in the United States is the safest, cleanest, and most wholesome in the world. The Department of Agriculture takes pride in the part it has played in making this true.

The Department considers that the safety of the nation's food is its first reesponsibility in carrying out assignments from the Congress. This principle guides USDA research programs and regulatory and service activities pertaining to foods and to the use of chemicals in food production and distribution.

The Department intends to continue and intensify its efforts to insure that American consumers get the foods they need and want, in adequate quantities at a reasonable price, and that these foods continue to meet the highest standards of nutritional quality and wholesomeness. It strongly endorses the safe use of carefully tested chemicals as required to maintain the excellence, variety, and economy of the foods we eat..

Role of Chemicals in Food Production

A wide variety of chemicals are used today in all phases of food production, processing, and marketing. They include chemical fertilizers, insecticides, and weed killers . . . antibiotics, antiseptics, and preservatives . . . feed additives, fumigants, fungicides . . . and others.

These chemicals are as essential for efficient production of foods on the farm as are tractors, improved varieties of crops, and better breeds of livestock. They play as great a part in assuring consumers a continuing supply of nutritious and appetizing foods as do our modern methods of food processing and marketing.

We cannot continue to produce adequate amounts of safe and wholesome foods without chemicals. Abandoning their use on farms and in the food industry would result in immediate decline in the quantity and overall quality of our food supply and cause a rapid rise in food prices paid by consumers.

On our farms, chemicals enable us to produce the great variety of foods people want in the tremendous quantities needed. They also give indispensable protection to the natural excellence of these foods against the ravages of pests and diseases. In large part because of chemicals, American consumers enjoy fruits, vegetables, cereals, meat, poultry products, and milk of unexcelled quality and freedom from contamination.

In our food factories and in trade channels, chemicals help to improve sanitation and maintain quality. They make possible many of our modern convenience foods, and in many other ways they aid in furnishing the bountiful, nutritious supply of good things to eat that we enjoy today.

Workers Named For Horticultural Posts

Gainesville, Fla. — The appointment of two assistant horticulturists has been announced by Dr. J. R. Beckenbach, director of the Florida Agricultural Experiment Station.

Dr. Willie E. Waters has been appointed to the Gulf Coast Experiment Station, Bradenton. He received his degree and did graduate work at the University of Kentucky. His doctorate was earned at the University of Florida while working as research assistant in vegetable crops.

Dr. Carl W. Campbell is the new assistant horticulturist at the Subtropical Experiment Station at Homestead. He received his doctorate from Purdue University after earning degrees at Illinois State Normal University and Kansas State College.

Dr. Campbell has been employed by the U. S. Department of Agriculture, doing research on post-harvest physiology of subtropical fruits, especially Tahiti limes, mangoes, lychees and avocados.

NATIONAL VEGETABLE CONTESTS ANNOUNCED FOR 4-H, FFA GROUPS

Gainesville, Fla. — Three national contests for 4-H Club and Future Farmers of America chapter members have been announced by the National Junior Vegetable Growers Association. The contests are in production and marketing, production demonstrations, and judging, grading and identification of vegetables.

J. D. Norton, assistant vegetable crops specialist with the Florida Agricultural Extension Service, Gainesville, is Florida coordinator for the programs.

Over 56 Million Boxes Oranges for Concentrate

More than 26,900,00 boxes of Florida oranges were processed into frozen orange concentrate to March 12 according to Robert W. Rutledge, Florida Citrus Mutual general manager in a current utilization report on Florida oranges and grapefruit.

He said that more than 14,445,000 boxes of oranges have gone into fresh channels as of March 12. This includes fresh and express shipments, export and home use.

"An estimated 6,555,000 boxes of oranges remain to be harvested for fresh fruit consumption, based on the current U. S. Department of Agriculture's estimate of 93 million boxes of Florida oranges," Rutledge said.

He said 24,650,000 boxes of grapefruit have been utilized in all channels to March 12 with an estimated remainder of 7,350,000 boxes to harvest, based on the USDA crop estimate. This includes fresh, cannery, frozen concentrate, chilled juice and chilled sections and salads.

Rutledge said an estimated remainder of 26,430,000 boxes of oranges will be utilized by concentrators in making their product.

Last season at this time concentrators had 25,212,000 boxes of oranges to be harvested for use in making frozen orange juice.

Rutledge said 53,525,000 boxes of oranges have been utilized in all channels to March 12. This includes concentrate, fresh, cannery and chilled juice, sections and salads.

"There is still practically no concentrate activity on Valencia oranges since ratio and solids have not changed much recently," Rutledge said. "Concentrating will probably begin about April 1."

The Farm Program Can Be Solved

by EZRA TAFT BENSON
Secretary of Agriculture

Last fall some members of my staff and I had a firsthand look at agriculture in three communist countries — Russia, Yugoslovia, and Poland. We came home all the more convinced of the superiority of our system of privately-owned family farms, the profit motive, competitive markets, and freedom for farmers to decide what they want to grow and market.

We have in America the most productive agriculture anywhere on earth. Our people should be unstinting in praise of the skill, hard work, and initiative of American farmers. Our farmers are the best in the world and it is no fault of theirs that we have been beset with some difficult problems in agriculture. I can think of no field of economic activity in which the U. S. is so clearly, so unmistakably, the world leader. Never in any other nation or civilization have so many been fed so well by such a small proportion of the population.

The Russians are paying us the supreme compliment of imitating our commercial agriculture. They imitate in order to compete. They acknowledge us as the world leader. Everywhere we went on the Soviet collective farms we saw posters urging the Russians to catch up and surpass the United States in agricultural production. But I feel sure they will never equal or surpass our production levels under their present system of agriculture. They cannot duplicate the efficiency and productive ingenuity which are called forth in a free society. I am confident of the inevitable triumph of the free American farmer in this competition—provided we preserve our freedom—provided we do not put an economic straitjacket on our agriculture.

How fortunate we are to live in this land, choice above all others! How grateful we should be and how determined to keep our country free and strong! This does not mean that we have no serious farm problems. We do, and we must not minimize them. Many farmers have not shared properly in our national prosperity. Agriculture in general has been caught in a cost-price squeeze. Soft wage settlements, high prices of machinery and high operating costs have hurt farmers. In 18 out of the past 20 years farmers' costs of production have increased. On the other hand in 7 of the past 20 years the prices farmers received for their products have gone down. That's one side of the picture.

The other side is that agriculture, and the whole American people, are beginning to face up to the basic problem. We can have every confidence in the judgment of a well informed public—a public that has the facts. But it is not easy to drive the facts home. We need to keep firmly in mind such facts as these:

Fact No. 1. There are two major groups in U. S. agriculture. Roughly 40 percent of our farms produce 90 percent of the farm products marketed. These are the more productive, well managed, commercial farms and ranches that in general are doing fairly well.

Roughly 60 percent of agriculture consists of part-time farmers, residential farmers, those on poor soil in isolated areas, those handicapped by age or illness, families with limited resources. They produce about 10 percent of the products marketed. Underemployment, not surpluses, is their big problem.

Obviously, we need two very different approaches to meet the needs of these two broad divisions in our agriculture. An understanding of this basic fact is essential to any sound solution of the agricultural problem.

Fact No. 2. The productivity of our farmers is growing about three times as fast as the productivity of workers in industry. Since 1950, output per man-hour in non-agricultural industry has risen at a rate of 2 percent per year. The increase of output per man-hour in agriculture has averaged 7 percent per year. This fact illustrates the futility of attempting to control total production by the present system of acreage allotments and marketing quotas.

Fact No. 3. Where our farmers have stayed free they have made their biggest and best advances in efficiency, in markets, and in income. Four-fifths of agriculture is free from all controls. On the other hand, those

commodities that have been least free have been in the worst trouble. Wheat, cotton, corn, rice, peanuts, and tobacco are the crops that have had chronic problems. They are also the crops that have depended the most on supports and controls.

Let me give just one example. Thirty years ago farmers harvested cotton on 43 million acres of U. S. farm land. In 1959 we harvested cotton on less than 15 million acres. And still we have a surplus. Our cotton used to hold 60 percent or more of the world market. Now, even with the aid of heavily subsidized export programs, we hold only about 30 percent of the market. In the past three years, as a result of an old outmoded program, the cost to the taxpayers of programs to keep U. S. cotton competitive in world markets has been about $1.2 billion.

Fact No. 4. The costs of farm prices and income stabilization programs have risen dangerously high. We have over $9 billion of surplus farm commodities in government inventory or under loan. The cost of storage, handling, and interest on these stocks is over a billion dollars a year—this is just the overhead cost of holding the surpluses. Such a situation is fantastic and indefensible. By next July we will have about $3½ billion tied up in surplus wheat alone. And the carryover of wheat will be large enough to provide about 500 loaves of bread for every man, woman, and child in the United States.

Fact No. 5. About one-third of our farms account for nearly all of our price support outlays. One-fourth of the cotton farms have three-fourths of the cotton acreage allotments. Two-fifths of the farms with wheat allotments have nine-tenths of the allotted acres. Thus, a relatively few farms account for practically all of the goverment price support outlays.

Fact No. 6. We have made some progress toward sounder farm programs, but it has been limited and painfully slow. The Agricultural Acts of 1954, 1956, and 1958 provided only a fraction of the program we asked for and what farmers need. Our full program has never been put into operation.

These six facts make it vividly clear that we must complete our revision of the farm programs without delay. Only Congress can do this job. It is later than many people think. Unless the needed changes are promptly made, disaster could result for the producers of some commodities. Wheat particularly is in an extremely critical position.

A new corn program enabled farmers in 1959 to plant all the corn they wished. Because increased acreage and record yields in a year of unusually good weather resulted in a peak corn crop, our critics contend the corn program has failed.

The farm problem is not hopelessly complicated. It can be solved. We must give freedom back to farmers. We must get rid of government's stranglehold on agriculture. Here is a 5-point program to do the job:

1. We need to expand the Conservation Reserve of the Soil Bank. This will enable farmers to retire additional cropland and put it into grass or cover until the time when it will be needed.

2. We need to use food for peace more effectively—to make better use of our surpluses in helping our friends abroad meet their food needs and develop their economies so as to become better customers in the future.

3. We need more aggressive and imaginative research to develop more new markets and more new uses for farm products.

4. We need to expand and improve the Rural Development Program which we started in 1955. This program is designed to aid the long forgotten 60 percent of our farm people by developing their skills, helping communities establish new industries, and providing better economic opportunities both on and off the land.

5. We need realistic, up-to-date price support programs—programs relating support to market prices in recent years, not to the obsolete parity formula based on conditions that existed in 1910 to 1914.

This 5-point program is needed NOW. It can solve the farm problem. It will preserve freedom. It will help promote a prosperous, expanding, and free agriculture in a prosperous, expanding, and free America—an America, under God, that is socially, economically, and spiritually sound.

26 Years Of Citrus Costs And Returns In Florida---1931-57

Through the cooperation of interested citrus growers, the Florida Agricultural Extension Service, which includes County Agents of the citrus producing counties and the Agricultural Experiment Stations, have conducted citrus costs and returns studies since 1931. The Extension Service study has included an average of 235 groves each season for 26 seasons, 1931-57. Costs only have been tabulated for 1957-58 as returns from all groves have not been compiled to date for this season.

The groves included in this study were scattered over the citrus producing area of Florida. From 75 to 85 percent of the groves have been in the four counties of Polk, Lake, Orange, and Highlands, varying somewhat in different seasons. During the 1956-57 season 86 percent of the groves and 80 percent of the acreage were in the four counties named. Twelve counties were represented in the study that season.

Averages of data from these groves are not presented as averages for the entire state of Florida. Groves included in these records are those of cooperators who would supply records. These groves usually have higher yields than the average grove of Florida, and it is presumed fruit is produced by these groves at somewhat lower costs per box. However, it is believed that trends in averages for these groves are similar to the trends in corresponding averages for all Florida groves of similar ages.

Total acreage in groves of all ages included in these records expressed as a percentage of the total Florida acreage of orange, grapefruit and tangerine trees over four years of age. The figure was larger each season except four, 1932-35 and 1936-37, than the corresponding season figure for percent of acreage and averaged 15 percent more. This indicates that the average yield for all ages of groves for the 26-year period was approximately 15 percent higher on the record groves than for the state as a whole. This comparison is made without regard to age of trees for the state as data on tree ages of 16 years and older are not available at this time.

The total acreage in groves of cooperators varied from 2,036 in 1931-32 to 10,479 in 1940-41. The average for the 26 seasons was 8,347 acres each season.

By ZACH SAVAGE
Agricultural Economist
Florida Agric. Experiment Station

Acreage Per Grove

Acreage per grove for the 26 seasons averaged 37 acres for the younger group and 35 acres for the older group of groves. In 1956-57 the average for groves 10 years of age and under was 45 acres per grove, 42 acres for groves over 10 years of age, and 42 acres for all groves. More than half of the groves included in this study contained less than 15 acres per grove.

The above paragraph on acreage per grove is based upon the grove units used in grove accounts. Ten of these grove units for accounting purposes were actually of multiple ownership in each of the units. These ten units represent a total of 171 grove ownerships. Recognizing these ownerships, there are 337 ownerships in the accounts listed as 176 groves. With 337 ownerships of 7,405 acres of groves in 1956-57, each ownership represents an acreage of 22.0 acres each. It has been claimed by some that there are 30,000 ownerships or properties in the state of Florida. If this is true, the 631,800 acres in Florida groves in 1956-57 would amount to 21.1 acres per ownership. From these figures it appears the acreage per ownership in account groves was 0.9 acres or 4 percent larger per ownership than for the state as a whole.

Trees Per Acre

Many calculations for large citrus acreages or the state acreage as a whole are on the basis of 65 trees per acre of land. The acreage included in this study averaged 60 trees per acre for the young group, 61 for the older group and 61 for both groups in 1956-57. Ninety-two percent of all groves of this study had less than 80 trees per acre.

Age of Grove

Citrus trees produce fruit somewhat in proportion to age. Age of tree from time of setting in the grove is the easiest and most convenient method of designating groves when comparing yields, costs and returns. From the inception of this work, groves have been divided into two age groups: Groves 10 years of age and under and groves over 10 years of age.

The average age of individual groves varied from those just set to 59 years. Nine percent of these groves were 10 years of age or less and the average age of groves included that were 10 years of age and under was four years. Ninety-one percent were over 10 years of age, and the average age of these 12 groups was 33 years. Sixty-nine percent of all groves were 26 to 40 years of age, and these same ages made up 75 percent of the groves over 10 years of age.

Trees seldom produce fruit during the first two seasons after setting. Some fruit is usually produced during the third season. Substantial increases in yield are common each season after the third year for a number of seasons. Data on tree ages of 16 years and older for the state are not available, which precludes the possibility of making a comparison of tree ages of this study with those of the state.

Many groves included in this study had mixed ages of trees. In such cases the average age was used. This average was weighted by the number of trees of each age.

Percent of Trees Grapefruit

The proportion or percent of the trees that were grapefruit influenced yield and cost. Production costs of bearing ages of grapefruit trees are

usually higher per acre and lower per box than orange.

A higher proportion of the younger group had 10 percent or less of the trees that were grapefruit than the older group. Twelve percent of the trees in the younger group were grapefruit as compared to 29 percent in the older group. Over the 26 seasons, 24 percent of the trees in the state were grapefruit as compared to 29 percent in the case of all record groves.

Percent of Fruit Grapefruit

Grapefruit trees usually produce higher yields than orange trees of the same age. This results in a higher proportion of the fruit being grapefruit than the proportion of trees that are grapefruit. These proportions of fruit vary somewhat by variety and age.

Groves 10 Years of Age And Under

The number of groves of these ages have been rather limited in these records during recent seasons, although the average for the 26 seasons has been 29 groves per season. The average age per season has varied from three to nine years, and the average for all 26 seasons was seven years. The acreage included has varied from 319 to 3,210 acres per season, with the average being 1,076 acres.

The average number of boxes of fruit harvested from this group of groves was 86 boxes per acre for the entire period. The average yield of 86 boxes per acre is 35 percent of the yield of the older group of groves 24 years of age.

Operating costs per acre averaged $67.97 for the 26 seasons of 1931-57. This average is 60 percent of the operating costs of the older group of groves which had an average age of 24 years.

Returns from fruit averaged $99.14 per acre for the 26-year period. This was 39 percent of the returns for the older group. Returns per box were slightly higher on the younger group. This was due, in part at least, to the smaller proportion of grapefruit in the younger group, since grapefruit usually brings a lower price.

Returns above operating costs average $31.17 per acre annually for the 26-year period. This was 22 percent of the corresponding figure of the older group. There was six seasons, 1932-33, 1951-52, 1952-53, 1954-55, 1955-56 and 1956-57 when returns from fruit failed to pay operating costs. Per-box returns above operating costs averaged 36 cents for the 26-year peeriod.

Upon dividing the first 15 years of this period into three 5-year periods, the per-box returns above operating costs were 16, 30 and 111 cents, respectively, for the three periods. High fruit prices during the latter period accounted for the good showing of the period when prices by seasons ranged from 96 cents to $2.02 per box. The five seasons of 1946-51 averaged 40 cents in returns above operating costs, and the average for the five seasons of 1951-56 was a loss of 47 cents per box. The average age of the latter seasons was only four years.

Interest on investment in grove land and trees was calculated from the grove operator's estimate of the valuation. The estimate requested was the investment in land and trees from the point of view of a long-time fruit-growing enterprise. Such valuations are often less than prices of grove sales during periods of high fruit prices, and are usually higher than grove sale prices during periods of depressed fruit prices.

Interest on estimated grove valuation at 6 percent averaged $26.53 per acre for the 26 seasons. This figure was 63 percent of the interest on the older group of groves.

Total cost without owner supervision included operating costs and interest on the grove investment. Interest on the grove investment is a production cost, although many growers do not so consider it. When interest is not considered as a cost, the operating costs figure is the one desired. But for those who consider in-

Tentative Program

15th GULF COAST CITRUS INSTITUTE

Dade City — Friday, April 29, 1960

Presiding — Fred P. Lawrence, Citriculturist, Agr. Ext. Service

9:00 a.m.	Invocation
9:05 – 9:10	Opening Remarks and Announcements, J. H. Higgins, County Agent, Pasco County.
9:10 – 9:30	The 1960 Spray Schedule — Why It Has Changed. James E. Brogdon, Entomologist, Agricultural Extension Service.
9:30 – 10:00	Soil Applications of Liquid Fertilizers. Dr. I. W. Wander, General Manager, Growers Fertilizer Cooperative, Lake Alfred, Florida.
10:00 – 10:15	**Cynanchium cubense** (Criesb) Woodson — What Is It? Henry Swanson, Orange County Agricultural Agent.
10:15 – 10:30	Recess
10:30 – 11:00	Maleic Hydrozide — Will it Protect Young Citrus Trees? Dr. C. H. Hendershott, Asst. Plant Pathologist, Lake Alfred Citrus Experiment Station.
11:00 – 11:10	The Florida Research Foundation — A quick report. Al Whitmore, President.
11:10 – 11:50	Florida Citrus Looks to the Next Decade. Homer Hooks, General Manager, Florida Citrus Commission.
11:50 – 12:00	Keep It Clean — Budwood, That Is. Bill Mathews, Horticulturist, Agricultural Extension Service.
12:00 – 1:15	NOON Dutch Lunch by Pasco County Home Demonstration Department.
1:15 – 1:30	The Tolerance Information Center — What It Is Attempting To Do For You. Jack T. McCown, Asst. Citriculturist, Agricultural Extension Service.
1:30 – 2:00	Don't Buy Grade — Buy Plant Food. Dr. H. J. Reitz, Horticulturist in-Charge, Lake Alfred Citrus Experiment Station.
2:00 – 2:10	Do We Want to Change the Institute Date from Friday to Some Other Day of the Week? — Fred P. Lawrence.
2:10 – 2:20	Recess
2:20 – 2:45	Modern Methods for Fresh Fruit — Where Do We Stand? Dr. W. Grierson, Associate Chemist, Lake Alfred Citrus Station.
2:45 – 3:10	The State Plant Board's Citrus Foundation Planting.
3:10 – 3:40	The Soil Science Foundation's Approach to Planting Poorly Drained Soils. Dr. O. C. Bryan, Technical Director, Soil Science Foundation.

terest on the grove investment as a production cost, additional calculations are here shown in order to determine the total cost without owner supervision and the net returns after considering interest as a cost.

Total cost without owner supervision averaged $94.50 per acre for the 26-year period, or $1.10 per box. This per acre figure was 61 percent of the corresponding figure for the older group of groves. The per-box figure of $1.10 was 75 percent higher than that of the older groves.

Net returns, after considering interest on the grove investment as a production cost, averaged $4.64 per acre annually, or five cents per box. There were 15 of the 26 seasons when returns from fruit were less than the total cost without owner supervision.

Groves Over 10 Years of Age

The number of groves of these records over 10 years of age varied from 45 to 272 per season and averaged 206. The first two seasons, 1931-32 and 1932-33, had considerably less than the average number of groves included. The grove acreage varied from 583 acres in 1931-32 to 9,853 acres in 1940-41, and averaged 7,271 acres per season. The latter figure was 2.33 percent of the average acreage in Florida bearing groves over this period.

The acreage per grove included in these records has not varied violently since the second season. The average acreage per grove was 13 acres for the 1931-32 season. Since that time the seasonal average has varied from 31 to 42 acres per grove, and the average for the 26 seasons was 35 acres. The acreage per individual grove varied from slightly less than two acres to 537.5 acres, with 63 percent with less than 20 acres in the 1956-57 season and 83 percent with less than 40 acres.

The average age of groves from time of setting the nursery stock varied by seasons from 17 to 33 years and averaged 24 years for the 26-year period. The average age of the 161 groves included in the 1956-57 season was 33 years. The age of grove should be kept in mind when comparing data, as it is accountable for a sizeable portion of the variations between groves or groups of different ages.

The number of trees set per acre remained rather static around 60 trees for the older group of groves throughout the record period. Such is not true of the younger group. This group increased from 60 in 1931-32 to 65 trees per acre in the 1935-36 season and recent seasons have varied between these two figures. Intervening seasons averaged as high as 78 trees per acre. The average for this group during the entire period was 67. The average for the older group was 61.

It should be pointed out that these data include records for some groves for only one season. Other groves weree included for varying numbers of seasons up to the entire 26 seasons. There were 13 groves included in these data for the 26 successive seasons. This turnover of the groves making up the records materially affected the number of trees per acre from season to season. The 5-year averages for the younger group were 62 during 1931-36, 70 during 1936-41, 75 during 1941-46, 68 during 1946-51 and 62 during 1951-56. The sample of younger groves has been rather small of recent seasons, so much so that upon the groves attaining the age of 11 years and transfer into the older group, there have not been sufficient acreages to increase materially the average number of treees per acre of the older group.

The percent of trees grapefruit is another important consideration when comparing the fruit harvested, costs, returns and net returns. Grapefruit groves usually have higher yields, higher costs per acre, lower returns and net returns per acre than orange groves of comparable ages. The cost per box is usually lower for grapefruit due to the higher yields. The per box is usually lower for grapefruit results in lower returns per acre and lower net returns per acre and per box.

The percentage of trees grapefruit averaged 31 for the 26 seasons for groves over 10 years of age. Individual seasons varied from 28 to 35 percent grapefruit trees.

Boxes harvested per acre averaged less than 200 each season prior to 1942-43, with the exception of the 1938-39 season when the average was 205 boxes. Average fruit harvested since that time, 1942-57, ranged from 225 boxes in 1944-45 — which was materially lowered by hurricane damage — to 447 boxes in 1953-54. The 1953-54 figure was the highest of the 26 seasons and was 24 percent higher than the second highest, 360 boxes in 1950-51, and 386 percent higher than the 92 box average in 1933-34. The average age of groves in 1956-57 was 33 years, which was five years older than in 1950-51 and 16 years older than in 1933-34. There were 10 of the 26 seasons, 38 percent, when less than 200 boxes were harvested per acre. The average age of trees during these 10 seasons was 19 years.

The average number of boxes harvested per acre for each of the five-year periods were: 1931-36 — 126; 1936-41 — 175; 1941-46 — 250; 1946-51 — 314 boxes and 1951-56 — 359. Yield for the third period was double that of the first, and the fifth period was 285 percent of the first. Some of the reasons for these increases in the number of boxes harvested per acre were increases in average age of trees, better fertilizer practices, larger proportion of fruit harvested due to good prices and the development of fruit processing.

Fruit prices were low for some seasons of the first two 5-year periods, resulting in some of the fruit remaining unharvested. Less damage from low temperatures and better grove care in general during the higher yields for these periods; and higher prices together with the development of fruit processing facilities, contributed to higher proportion of the fruit being harvested. The number of boxes harvested per acre varied from 45 to 769 on 61 groves over 10 years of age in the 1956-57 season. Forty-eight percent of these groves had less than 350 boxes harvested per acre in 1952-53 and 44 percent in 1954-55 and 52 percent in 1956-57. Ninety-one percent had less than 550 boxes in 1956-57. From 22 percent of these groves less than 250 boxes were harvested per acre in 1956-57.

Operating costs were made up of five items: (1) Labor, power and equipment, (2) fertilizer materials,

(3) spray and dust materials, (4) state and county taxes and (5) miscellaneous costs. Operating costs for the first eight years of this study, 1931-39, averaged $57.90 per acre. The following season 1939-40, such costs were $53.45. There was an increase in operating costs each year from 1939-40 to 1946-47, which means an increase each season for seven successive seasons. During part of this time the increase was rather rapid, and these costs were $159.89 per acre in 1946-47.

(Concluded Next Issue)

California Lifts Fumigation Ban On Florida Citrus

With a few exceptions, California no longer is requiring fumigation for Florida-produced citrus fruits.

In a communication to the State Plant Board, E. A. Breech of the California Department of Agriculture advises that citrus fruits from Florida now may be shipped into that state without treatment under certain conditions. Generally, the fumigation process will be required only for citrus intended for the California counties of Riverside, Tulare and Ventura.

Florida's Plant Board has been negotiating with California officials for several years in an effort to ease restrictions on the entry of citrus fruits into that state. The decision to lift most requirements for fumigation still must be viewed as an experimental move, in the opinion of Florida Plant Commissioner W. G. Cowperthwaite.

"California citrus problems are quite unlike those of Florida," he said. "Regulations stem from individual counties there and some counties are carrying out eradication programs for a number of pests which are common to Florida, such as chaff scale and purple scale. Under the California setup, any county may require fumigation of citrus fruit entering from another county or from another state when the fruit carries live surface pests prohibited by local regulations."

The plant commissioner suggested that Florida citrus fruit shippers contact their California brokers for recommendations on the handling of fruit before shipment. In some instances it would be advisable to fumigate the fruit in Florida to insure prompt delivery in California.

The treating process in Florida has been handled largely in the past at the Plant Board's fumigation station at Minneola. This station will continue to handle truckloads of citrus ticketed for the three California counties, for four counties in Texas, and for all points in Arizona.

In his letter, Breech explained that the Citrus Pests Exterior Quarantine had been amended to remove the requirement of annual surveys for citrus canker as a condition for shipping citrus fruits into California. With the amendment came revision of the master permit issued to Florida, the change making limes admissable from the entire state and other citrus from all counties except Monroe.

County agricultural commissioners from Riverside, Tulare and Ventura counties in California have served notice that untreated fruit received there must be treated upon arrival.

California issues the master permit to Florida shippers through the Florida Plant Board with the understanding that the state is free of citrus cancer and that immediate notice will be given if cancer or a dangerous fruit fly is detected.

Only one permit is needed and must accompany the waybill if packed or bulk fruits are shipped by common carrier. All doors or railway cars and trailer truck vans must be sealed at the shipping point.

Citrus fruits from Florida may be inspected at any point in California and are subject to fumigation if requirements are not met.

Breech pointed out that the master permit may be amended or rescinded at any time. The State Plant Board will withhold issuance of permits upon receipt of a notice of vocation from California officials.

The LYONIZER

COMPILED BY THE LYONS FERTILIZER COMPANY

Reports Of Our Field Men . . .

NORTH CENTRAL FLORIDA

V. E. Bourland
Winter Garden, Fla.
Phone 107

We are having rain, and winter weather again. Groves are looking very good considering weather conditions, with good growth, and lots of bloom, growers are putting on spring top dresser, and from all indications we should have a good setting of fruit unless the cold shocks the trees so that it would cause them to shed. Valencias have started moving, but not a great volume. Banks have been removed from young trees, and are being worked and fertilized, they came through the winter in good shape except in low, cold spots, most of the young trees have a good growth and are looking fine.

HIGHLANDS AND POLK COUNTIES

R. E. Lassiter, Jr. & R. S. Carlin
P. O. Box 1304
Winter Haven, Fla.

Moisture conditions in this area have been very good up until the time of this writing and this has been most beneficial in helping to bring about an excellent growth on the citrus trees and also a very good bloom this spring. The bloom has been held back to some extent by the cool weather which we have experienced up through the middle of March.

The application of post-bloom sprays should start in another few weeks when the petals have fallen from the blossoms. Where nutritional sprays have not already been applied, growers will be using these materials in their post-bloom spray; especially, in the blocks where the deficiency patterns have been evident. In blocks where scale is a problem at this time, a scalicide should be used.

Most growers have already applied the first fertilizer application to the young trees. These treees should be fertilized every six weeks throughout the summer.

There has been extensive hedging of groves during the past few weeks. We have probably seen more hedging this year than any year in the past. This has been due to the fact that growers have been able to move fruit early this year and thus hedge before the spring growth has started.

WEST HILLSBOROUGH, PASCO AND PINELLAS COUNTIES

J. W. Boulware
Phone WEbster 8-2638
Tampa, Fla.

Citrus trees remain in an excellent condition throughout this area. Recent rains have kept moisture coming to the trees and it appears that we have set a heavy new crop and have excellent new growth.

Valencias have begun to move in volume and we look forward to orderly marketing for the remainder of this good and uniform price season.

If you have not yet applied your post bloom spray, now is the time to give it thorough consideration. Many groves are beset with spider mites and rust mites and melanose is quite prevalent.

A number of growers have asked about a cure for the burrowing nematode which causes spreading decline. We can only refer to the statement made by Dr. Herman J. Reitz of the Florida Citrus Experiment Station, dated January 29, 1960, which states in some detail that a technique that appears to have some promise is under development but is not yet thoroughly tested.

SOUTH HILLSBOROUGH, MANATEE AND SARASOTA COUNTIES

Eaves Allison
P. O. Box 365, Sarasota, Fla.
Phone Fulton 8-2611

The bloom is heavy, and new growth on citrus is coming out in force now—March 16th. However, near-freezing temperatures and cold, raw winds, along with some heavy rains have done their bit to partially defoliate some sections of some groves. This defoliation has taken place without any evidence of brown or frozen leaves.

Young trees still do not have that flourishing look of "Spring is Here" — although they are budded out and have ample signs of new growth in all stages. With the weather they have had it is no wonder they don't look happy! However, we have one consolation in the fact that moisture conditions are highly in favor of a good fruit setting.

SOUTH POLK, HIGHLANDS, HARDEE AND DeSOTO COUNTIES

C. R. Wingfield
Phone: Glendale 3-4537
Avon Park, Fla.

March came in with a mighty blow and at this writing (18th), the winds have managed to blow us some of the rather nasty weather that has prevailed over the nation. Torrential rains fell over the Central Florida areas from coast to coast and caused flooding and heavy property damage in its path.

No damage is expected to citrus trees but as we are in a blooming stage it is highly possible we will see a lighter set of fruit if the bloom was wide open at the time of these rains. The tree is in a very vigorous condition and will set all it can carry from bloom not yet open. Fruit movement in March has been rather slow.

HILLSBOROUGH, PASCO AND SUMTER COUNTIES

C. W. Dean
Gibsonton, Fla.
Phone Tampa 40-2592

At the time of this writing, the weather is very wet, rain and more rain. Am wondering what this is going to do to our citrus. Of course with what bloom these rains will cause the trees to lose, there seem to be an abundance of bloom yet coming to give us a good crop.

The vegetable growers around the Plant City and Webster areas are hard hit. They had just got their crops in a good growing condition and were coming along very good. At the present the vegetable growers have the blues. All we can hope for is for the rains to stop, the wind to blow for a few days and for it to stay cool. In this way, there is a chance for the ground to dry enough and not cause plants to scald.

Climate On Ground And 5 Feet Higher Often Varies Much

The microclimate — that around growing crops in the field—often varies widely from the macroclimate —that in which man lives and which is measured by the various weather stations.

This has been illustrated in studies at the University of Florida Agricultural Experiment Station by a research team in the agronomy department. Members of the team include Dr. G. M. Prine, Dr. O. C. Ruelke, Dr. S. H. West, Dr. V. N. Schroeder and Keith Butson. They use a mobile laboratory.

They have found that on a fair September day in Gainesville the temperature measured in a five-foot weather shelter was 92° F., while that of an alfalfa stem recently defoliated by cutting for hay was 129° F. Temperatures above 140° F. have been measured at the surface of bare soils in Florida.

During cold winter nights, says Dr. Prine, temperatures in low-growing vegetation may be 6 to 10 degrees lower than that reported by the local weather stations.

Besides measuring the microclimate, the scientists are trying to modify it in a manner beneficial to plants. In one experiment they studied the advantage of planting rows running in different directions.

Temperature of the soil at a 1-inch dept and air at 3- and 12-inch heights at the middle of a fair day in December was as much as 7 to 10 degrees higher in rows of sweet blue lupine running north and south than in those running east and west.

Sunshine reached the ground in the north-south rows, not in the east-west ones. Winds and clouds reduced the temperature differences between plots.

During the winter of 1958-59, however, more lupine freeze damage occurred when the rows ran north and south. Microclimate research is being continued with winter-grown crops.

Classified Ads

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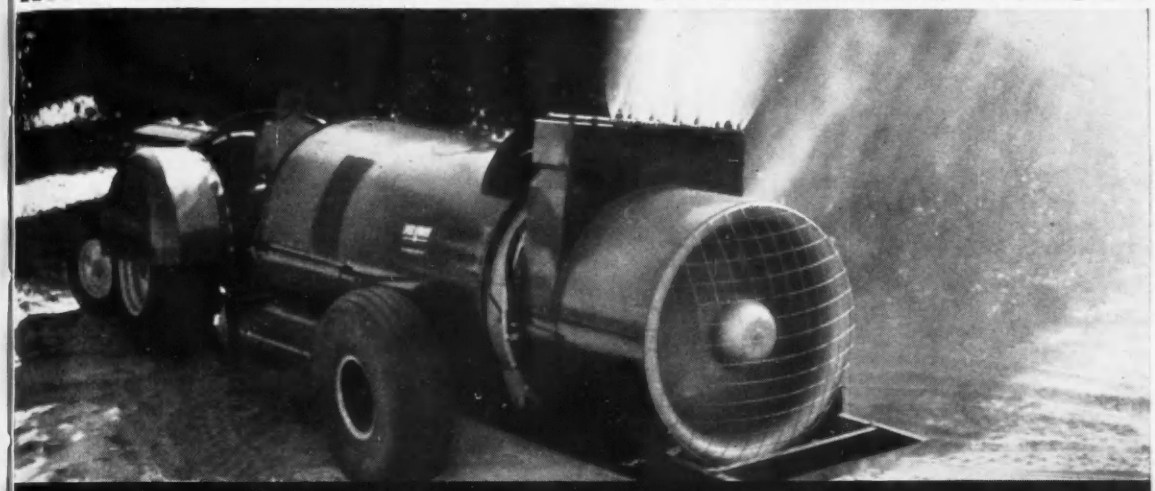

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